

## V. ENDO-ANEURYSMORRHAPHY (MATAS).

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THE ideal operation for the cure of aneurism is one which arrests completely and permanently the circulation of blood in the sac, without interfering with the blood supply in the parts beyond the aneurism. These two objects have always been in the mind of the surgeon and numerous operations have been devised which have accomplished them in certain situations.

The Matas operation comes nearer the ideal than any other, and is more generally applicable. Certain aneurisms, like those of the thoracic aorta, are probably beyond the field of operative surgery, but in every accessible variety where the circulation can be temporarily controlled, the Matas operation can be employed. Accessibility and temporary control of the circulation are essentially necessary, and where impracticable the operation should not be attempted. These limitations, however, do not prevent endo-aneurismorrhaphy being more universally applicable than any other operation for the cure of aneurism. It is not, however, the general applicability of the operation which has caused it to take first rank as a radical cure, but especially the fact that it interferes less with the blood supply beyond the aneurism than any other.

The experimental work of Carrell, in this country, and of San Martín, Höpfner, Payr, Ullman, Jassinowski, Glick, and others abroad, together with the clinical and experimental work of Abbe, Murphy, Crile, Brewer, Hubbard and Matas, has shown with what readiness the blood vessels lend themselves to plastic operations. Suture, anastomosis, transplantation, substitution of vein for artery, arteriotomy for embolism, all of which have now been shown to be perfectly practicable, give some idea of the possibilities of vascular surgery.

The Matas operation has for its foundation this experi-

mental and clinical work. It having been shown that when intima is approximated to intima union occurs just as when two peritoneal surfaces are placed in contact, Matas conceived the idea of closing the openings of the blood vessels in the aneurismal sac and of obliterating the sac by approximating its walls. He first operated by this method in 1888,<sup>1</sup> and reported a case, but his paper attracted little attention. At the time of publication of his second paper, in 1903,<sup>2</sup> he had done this operation four times. He suggested two other possibilities; first, the repair of the artery in sacciform aneurism, and second, the reconstruction of the artery in fusiform aneurism when the openings of the vessel were on the same line and not too far apart. To show that these were good suggestions it is only necessary to point to the successful cases since reported.

Bickham,<sup>3</sup> in an excellent paper, has shown that the principle of endo-aneurismorrhaphy is equally applicable to all accessible arteriovenous aneurisms, a variety in which ligation is especially dangerous, because of the likelihood of gangrene resulting from obstructed circulation.

Matas' own papers are so complete and comprehensive that it is unnecessary to go minutely into the technique. Briefly, the operation consists in controlling the flow of blood in the diseased vessel by compression; the free incision of the sac from end to end; the evacuation of its contents; the closure by suture of the arterial openings in it; and then the obliteration of the sac by plication and infolding of the skin. In the case of a sacciform aneurism but one opening requires closure, and when this is done the caliber of the vessel is, of course, reestablished. In the fusiform aneurism there are two courses open to the operator—one, of closure of the two openings of the artery into the sac, and of any collaterals which may originate within the sac, and then the entire obliteration of the sac by continuous rows of sutures; or, he may reconstruct the arterial caliber by suture over a catheter which is withdrawn before the last sutures are tied. Although I consider that the operation is no longer on trial, yet it is

important that all cases operated on should be reported in order to compare the results with those of the older operations. In Matas's last paper<sup>4</sup> he classified 34 operations performed by twenty-one American surgeons, and referred to 6 foreign cases done by three operators, in which there was considerable variation of the technique—so much in fact that he is not inclined to combine them with the American cases. He believes that there has been a great misapprehension regarding the technique on the part of foreign surgeons, many of whom have on this account disapproved of the operation. In this series of 34 cases there have been but two deaths, neither attributable to the operation itself. One patient died fifteen days after operation from associated pyelitis and nephritic coma, the wound having healed completely. The other patient died on the seventeenth day after operation. This patient had an aneurismal diathesis and after operation developed multiple aneurisms. He was first operated on for a ruptured aneurism of the right popliteal, the sac was extirpated; he then developed a left femoral aneurism which was operated on by the Matas method. Twenty days later the vessel above the aneurism dilated and ruptured at a point where a traction loop had been applied for the temporary control of the circulation. Ligation of the femoral high up was then done but suppuration took place and later gangrene of the foot. Six days after this a secondary hemorrhage occurred and the external iliac was ligated, the gangrene extended, and the leg was amputated in the mid thigh. The patient died in about two weeks from exhaustion. It should be noted that in this case neither secondary hemorrhage nor gangrene took place until the vessel was ligated.

In none of the other cases did either hemorrhage or gangrene occur as a complication.

In considering the question of permanent cure, Matas divides the operations into obliterative, those in which the arterial openings were closed and the sac obliterated; restorative, those in which the aneurisms were sacciform and the arterial opening was closed without interfering with the circulation in the artery; and reconstructive, those in which a new

vessel was constructed from the aneurismal sac. There were 22 of the obliterative cases with no relapses; there were 7 restorative cases with no relapses; there were 5 reconstructive cases with 2 relapses. In one of these an amputation was done at the patient's request. In the other case a second operation was done, the openings in the sac being occluded by suture, and a cure resulted.

I have been able to add to this collection of 34 cases 3 from recent literature, (McCord,<sup>5</sup> Brown,<sup>6</sup> and Yocum<sup>7</sup>); a second case of my own, and a second case of Frazier's<sup>8</sup> making in all 5 additional cases. Two of these were reconstructive operations, both of which were followed by good recoveries without complications; one was a restorative operation with an equally good result; two were obliterative operations, in one gangrene occurring on the fourth or fifth day necessitating amputation, after which the patient recovered; and in the second, my own case, death occurred on the 59th day from uræmia, the patient having been in a bad condition from chronic Bright's disease at the time of operation. The wound in this case was practically healed and the cedema of the limb had disappeared. My first case was operated upon on October 26, 1904.<sup>9</sup> I examined this man a few days ago and there was no evidence of any return of the aneurism, and after two years and a half it is unlikely that any recurrence will take place.

In this connection it is interesting to refer to a case of popliteal aneurism reported by J. Goyanes,<sup>10</sup> of Madrid, in which he ligated the artery above and below the sac, and then transplanted a section of the popliteal vein to bridge the defect in the artery. The result was successful. This operation was suggested by San Martin in 1902, and this is the first clinical case. The anastomosis was made according to the technique of Carrell. It is impossible to say what the future of this operation will be, but it certainly is of limited applicability and requires the most expert handicraft. It is unlikely that one who has not done considerable experimentation with arterial suture would be justified in attempting it, especially

when the Matas operation is so much simpler and gives such remarkably good results.

In a ruptured aneurism with a large false sac, such as was found in my second case, it is difficult to carry out completely the Matas technique. The lining membrane has not yet taken on the characteristics of the intima of the vessel, nor is it sufficiently organized to stand the necessary traction by the sutures to permit of obliteration. Even in these cases, however, the openings of the vessels in the sac can be closed by suture and the principal benefit of the Matas operation gained, namely, the cure of the aneurism with the least possible interference with the circulation of the part.

The great disadvantage of the older operations is the extent to which they interfere with the circulation of the part beyond the aneurism, and the consequent frequency of gangrene. The ligation operation not only interferes with the circulation in the sac, but also cuts off a certain number of anastomotic branches which originate between the ligatures and the sac. The extirpation operation, although it allows the ligatures to be applied much nearer the sac, also greatly interferes with the establishment of anastomotic circulation by injury of the surrounding tissue, and gangrene frequently follows.

The Antyllian operation, although not cutting off as many anastomotic branches as the ligation or extirpation operations, at the same time does require considerable manipulation beyond the sac in order to apply the ligatures and consequently is objectionable. To my mind, the Matas operation is the simplest yet devised, and the least likely to be followed by gangrene. That it is curative the statistics show conclusively.

The following is an account of my second case :

Dr. F., aged 57 years, was operated upon at the Bryn Mawr Hospital, on November 24, 1906. I first saw the patient on October 30th with Dr. Walter Chrystie. At that time he had a small popliteal aneurism about the size of a hen's egg. He had been having some fever and was generally in very bad con-

dition. His urine contained albumin and casts and the secretion was scanty. His vessels were atheromatous and he had valvular heart disease. At this time he was put on increasing doses of iodide. I next saw him on November 13th with Drs. Earnshaw and Gamble. His general condition had not improved, excepting that the kidney secretion was greater. Two days before operation his pulse was 120 and of very high tension. The leg was very much swollen, which had developed since I first saw him. The pain had been so great since the increase in the size of the aneurism that morphia had to be used pretty continuously. On account of his general condition I was very loathe to operate upon him, but he suffered so much that there seemed to be nothing else to do. He had gotten up to 75 grains of iodide a day. Half an hour before operation he was given 1-6 of a grain of morphine and 1-100 of a grain of scopolamine. A tourniquet was applied until the pulsation ceased, and I then injected the line of incision with Schleich fluid. I made an incision, opened and evacuated the aneurismal sac without causing much pain. The aneurism had ruptured and a false sac had been formed in the surrounding tissues. The removal of the organized portion of the clot caused considerable pain, and as I was unable to detect with my finger the arterial openings in the sac, and if I had found them, would have been unable to suture them because any attempt to put the patient's leg straight gave him a great deal of pain, I was compelled to give him ether. I found both openings in the sac and closed them by suture. The sac was very friable and the sutures cut very easily, so that I had considerable difficulty in closing the openings, especially the proximal one. The sac wall was so friable that I could not reef it over, as is done in the Matas operation, and I therefore simply introduced a gauze pack and a few sutures in the muscular structures. The patient stood the operation, which occupied forty-five minutes, very well.

The next day he was passing a sufficient quantity of urine, his pulse had dropped to 104, and was of much lower tension. The swelling of the leg had greatly decreased, he had practically no pain, and his temperature was normal. The circulation in the foot was good, though no pulsation could be felt in the anterior tibial. This pulse could not be detected before the operation. This improvement in the patient's condition was only

temporary, however, as the kidney and heart lesions steadily progressed until January 22, 1907, when he died of uræmia. At the time of his death there was no œdema or other recurrence of the aneurism. The wound had gradually filled up with granulation, until there was only a superficial area unhealed.

The only advantage of the operation in this case was that the patient was completely relieved of his pain and was able for a while to get out of bed with comparative comfort.

#### REFERENCES.

- <sup>1</sup> Matas, Medical News, Phila., October 27, 1888.
- <sup>2</sup> Matas, Annals of Surgery, February, 1903.
- <sup>3</sup> Bickham, Annals of Surgery, Vol. 39, 1904, p. 767.
- <sup>4</sup> Matas, Journal of American Medical Association, September 29, 1906.
- <sup>5</sup> R. C. McChord, Jour. Amer. Med. Assn., Vol. 47, 1906, p. 993.
- <sup>6</sup> Israel Brown, Jour. Amer. Med. Assn., Vol. 47, 1906, p. 362.
- <sup>7</sup> James R. Yocum, Jour. Amer. Med. Assn., September 29, 1906.
- <sup>8</sup> Charles H. Frazier, Annals of Surgery, September, 1907.
- <sup>9</sup> John H. Gibbon, American Medicine, August 19, 1905.
- <sup>10</sup> J. Goyanes, Siglo Medico, September 8, 1906.